

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 2

**IN THE CLAIMS:**

1. (Once Amended) A semiconductor integrated circuit device  
comprising:

a semiconductor chip having a main surface including semiconductor  
elements and a plurality of bonding pads;

a leadframe having:

a chip mounting portion for mounting said semiconductor chip;

suspension leads unitarily formed with said chip mounting portion, a  
width of said chip mounting portion being wider than a width of each of said  
suspension leads; and [,]

a plurality of [inner lead portions] leads arranged to surround said  
semiconductor chip and being electrically connected with said bonding pads  
by bonding wires; and

[a plurality of outer lead portions individually connected with said inner  
lead portions; and]

a resin member sealing said semiconductor chip, at least a portion of said  
[inner lead portions] plurality of leads, said chip mounting portion, said suspension  
leads and said bonding wires;

wherein said chip mounting portion is smaller than said semiconductor chip  
and is positioned under a substantially central portion of said semiconductor chip,  
said semiconductor chip is fixed to said chip mounting portion by adhesive, said  
semiconductor chip is fixed to a part of each of said suspension leads by adhesive  
which is located under a peripheral portion of said semiconductor chip, and an

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 3

adhesive region of said chip mounting portion and said semiconductor chip and an adhesive region of each of said suspension leads and said semiconductor chip are separated from each other, and wherein said suspension leads and said chip mounting portion of said leadframe are continuously formed in an area of said semiconductor chip.

2. (Unamended) A semiconductor integrated circuit device according to claim 1, wherein each of said suspension leads includes a first portion and a second portion which is wider than said first portion, wherein said second portion is separated from said chip mounting portion and is positioned under said peripheral portion of said semiconductor chip, and wherein said semiconductor chip is fixed at said second portion of each of said suspension leads.

3. (Unamended) A semiconductor integrated circuit device according to claim 1, wherein said semiconductor chip is of a tetragonal shape.

4. (Unamended) A semiconductor integrated circuit device according to claim 1, wherein said semiconductor chip includes a rear surface opposing said main surface and is fixed to said chip mounting portion and said suspension leads at one portion of said rear surface, and wherein the other portion of said rear surface which is exposed from said chip mounting portion and said suspension leads is directly contacted to said resin member.

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 4

5. (Unamended) A semiconductor integrated circuit device according to claim 2, wherein said semiconductor chip is a rectangular shape and said suspension leads include four suspension leads, and wherein four corners of said rectangular-shaped semiconductor chip are supported by said four suspension leads.

6. (Once Amended) A semiconductor integrated circuit device according to claim 5, wherein said resin member has a rectangular shape, and wherein said [outer lead portions are extended outwardly from] plurality of leads extend in a direction of four sides of said rectangular-shaped resin member.

7. (Unamended) A semiconductor integrated circuit device according to claim 6, further comprising:

a plurality of grooves for positioning the semiconductor chip, said grooves each formed on said four suspension leads.

8. (Unamended) A semiconductor integrated circuit device according to claim 6, further comprising:

a plurality of projections for positioning the semiconductor chip, said projections each formed on said four suspension leads.

9. (Unamended) A semiconductor integrated circuit device according to claim 7, wherein said grooves are arranged on said four suspension leads so as to accord to four corners of said rectangular-shaped semiconductor chip.

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US6  
Page 5

10. (Unamended) A semiconductor integrated circuit device according to claim 8, wherein said projections are arranged on said four suspension leads so as to accord to four corners of said rectangular-shaped semiconductor chip.

11. (Once Amended) A semiconductor integrated circuit device comprising:  
a semiconductor chip having a main surface including semiconductor elements and a plurality of bonding pads;

a leadframe having:

a cracking suppression means for mounting said semiconductor chip thereon and for suppressing, during a reflow soldering processing, device cracking, wherein said cracking suppression means is a chip mounting portion which is smaller than said semiconductor chip and which is positioned under a substantially central portion of said semiconductor chip; [.]

suspension leads unitarily formed with said chip mounting portion, a width of said chip mounting portion being wider than a width of each of said suspension leads; and [.]

a plurality of [inner lead portions] leads arranged to surround said semiconductor chip and being electrically connected with said bonding pads by bonding wires; and [, and]

[a plurality of outer lead portions individually connected with said inner lead portions; and]

a resin member sealing said semiconductor chip, at least a portion of said [inner lead portions] plurality of leads, said chip mounting portion, said suspension leads and said bonding wires;

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 6

wherein said semiconductor chip is fixed to said chip mounting portion by adhesive, said semiconductor chip is fixed to a part of each of said suspension leads by adhesive which is located under a peripheral portion of said semiconductor chip, and an adhesive region of said chip mounting portion and said semiconductor chip and an adhesive region of each of said suspension leads and said semiconductor chip are separated from each other, and wherein said suspension leads and said chip mounting portion of said leadframe are continuously formed in an area of said semiconductor chip.

12. (Unamended) A semiconductor integrated circuit device according to Claim 11, wherein said semiconductor chip includes a rear surface opposing said main surface and is fixed to said chip mounting portion and said suspension leads at one portion of said rear surface, and wherein the other portion of said rear surface which is exposed from said chip mounting portion and said suspension leads is directly contracted to said resin member.

13. (Once Amended) A semiconductor integrated circuit device comprising:

a semiconductor chip having a main surface including semiconductor elements and a plurality of bonding pads;

a leadframe having:

a chip mounting portion for mounting said semiconductor chip; [,]

suspension leads unitarily formed with said chip mounting portion, a width of said chip mounting portion being wider than a width of each of said

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 7

suspension leads; and [,]

a plurality of [inner lead portions] leads arranged to surround said semiconductor chip and being electrically connected with said bonding pads by bonding wires; and [, and]

[a plurality of outer lead portions individually connected with said inner lead portions; and]

a resin member sealing said semiconductor chip, at least a portion of said [inner lead portions] plurality of leads, said chip mounting portion, said suspension leads and said bonding wires;

wherein said chip mounting portion is smaller than said semiconductor chip and is positioned under a substantially central portion of said semiconductor chip, said semiconductor chip is fixed to said chip mounting portion by adhesive, said semiconductor chip is fixed to a part of each of said suspension leads by adhesive which is located under a peripheral portion of said semiconductor chip, and an adhesive region of said chip mounting portion and said semiconductor chip and an adhesive region of each of said suspension leads and said semiconductor chip are separated from each other.

14. (Once Amended) A semiconductor integrated circuit device comprising:

a semiconductor chip having a main surface including semiconductor elements and a plurality of bonding pads;

a leadframe having:

a cracking suppression means for mounting said semiconductor chip

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 8

thereon and for suppressing, during a reflow soldering processing, device cracking, wherein said cracking suppression means is a chip mounting portion which is smaller than said semiconductor chip and which is positioned under a substantially central portion of said semiconductor chip,

suspension leads unitarily formed with said chip mounting portion, a width of said chip mounting portion being wider than a width of each of said suspension leads; [,]

a plurality of [inner lead portions] leads arranged to surround said semiconductor chip and being electrically connected with said bonding pads by bonding wires; and [, and]

[a plurality of outer lead portions individually connected with said inner lead portions; and]

a resin member sealing said semiconductor chip, at least a portion of said [inner lead portions] plurality of leads, said chip mounting portion, said suspension leads and said bonding wires;

wherein said semiconductor chip is fixed to said chip mounting portion by adhesive, said semiconductor chip is fixed to a part of each of said suspension leads by adhesive which is located under a peripheral portion of said semiconductor chip, and an adhesive region of said chip mounting portion and said semiconductor chip and an adhesive region of each of said suspension leads and said semiconductor chip are separated from each other.

15-36 (Canceled)

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 9

37. (Twice Amended) A semiconductor device comprising:

(a) a semiconductor chip having a plurality of semiconductor elements and bonding pads formed on a main surface thereof;

(b) a lead frame having:

a chip mounting portion for mounting said semiconductor chip;

a plurality of leads; and

suspension leads continuously formed with said chip mounting portion,

said semiconductor chip being mounted on said chip mounting portion;

(c) an insulating tape adhered to at least said plurality of leads and said suspension leads;

(d) bonding wires electrically connected to said plurality of leads with said bonding pads of said semiconductor chip respectively, and

(e) a resin member sealing said semiconductor chip, said bonding wires, said insulating tape, said chip mounting portion, a part of each of said suspension leads, and at least a portion of said plurality of leads,

wherein a size of said chip mounting portion is smaller than that of said semiconductor chip, and

wherein said insulating tape has a frame shape and is continuously formed between said suspension leads and said plurality of leads.

38. (Unamended) A semiconductor device according to Claim 37, wherein said resin member has a rectangular shape, wherein said suspension leads extend from said chip mounting portion toward four corners of said resin member, and



KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 10

wherein said plurality of leads are arranged between said suspension leads in a plane view.

39. (Unamended) A semiconductor device according to Claim 37, wherein said insulating tape extends along four sides of said resin member to surround said chip mounting portion and said semiconductor chip in a plane view.

40. (Twice Amended) A semiconductor device comprising:

(a) a semiconductor chip having a plurality of semiconductor elements and bonding pads formed on a main surface thereof;

(b) a lead frame having:

a chip mounting portion for mounting said semiconductor chip;

a plurality of leads; and

suspension leads continuously formed with said chip mounting portion,

said semiconductor chip being mounted on said chip mounting portion;

(c) an insulating tape adhered to at least said plurality of leads and said suspension leads;

(d) bonding wires electrically connected to said plurality of leads with said bonding pads of said semiconductor chip respectively, and

(e) a resin member sealing said semiconductor chip, said bonding wires, said insulating tape, said chip mounting portion, a part of each of said suspension leads, and at least a portion of said plurality of leads,

wherein a size of said chip mounting portion is smaller than that of said semiconductor chip.

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 11

wherein said insulating tape has a frame shape and is continuously formed between said plurality of leads and said suspension leads.

wherein said insulating tape includes a base insulating film and an adhesive layer applied to one surface of said base insulating film, and

wherein said insulating tape is adhered to said plurality of leads and said suspension leads by said adhesive layer.

41. (Unamended) A semiconductor device according to Claim 40, wherein said base insulating film includes a polyimide resin and said adhesive layer includes an acrylic resin.

42. (Twice Amended) A semiconductor device comprising:

(a) a semiconductor chip having a plurality of semiconductor elements and bonding pads formed on a main surface thereof;

(b) a lead frame having:

a chip mounting portion for mounting said semiconductor chip;

a plurality of leads; and

suspension leads continuously formed with said chip mounting portion,

said semiconductor chip being mounted on said chip mounting portion;

(c) an insulating tape adhered to at least said plurality of leads and said suspension leads;

(d) bonding wires electrically connected to said plurality of leads with said bonding pads of said semiconductor chip respectively, and

(e) a resin member sealing said semiconductor chip, said bonding wires, said

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2008 Office Action

501.32049RV2/329201392US5  
Page 12

insulating tape, said chip mounting portion, a part of each of said suspension leads,  
and at least a portion of said plurality of leads,

wherein a size of said chip mounting portion is smaller than that of said  
semiconductor chip,

wherein said insulating tape has a frame shape and is continuously formed  
between said plurality of leads and said suspension leads,

wherein said lead frame having a first surface and a second surface opposite  
to said first surface, wherein each of said suspension leads has a step portion so  
that said first surface of said chip mounting portion is positioned to the side of said  
second surface of said plurality of leads rather than the side of said first surface of  
said plurality of leads, and

wherein said insulating tape is arranged outside said step portion of each of  
said suspension leads.

43. (Unamended) A semiconductor device according to Claim 43, wherein a  
part of each of said suspension leads, which is located outside said step portion, is  
substantially at a same level as portions of said plurality of leads in a thickness  
direction of said lead frame.

44. (Unamended) A semiconductor device comprising:

(a) a semiconductor chip having a plurality of semiconductor elements and  
bonding pads formed on a main surface thereof and a rear surface opposite to said  
main surface;

(b) a lead frame having a first surface and a second surface opposite to said

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 13

first surface, said lead frame having:

a chip mounting portion for mounting said semiconductor chip;

suspension leads continuously formed with said chip mounting portion;

and

a plurality of leads;

(c) a plurality of bonding wires electrically connected to said plurality of leads with said bonding pads of said semiconductor chip respectively; and

(d) a resin member sealing at least said semiconductor chip, said bonding wires, said chip mounting portion and at least portions of said plurality of leads,

wherein a size of said chip mounting portion is smaller than that of said semiconductor chip, and

wherein said semiconductor chip is mounted on said chip mounting portion, such that said rear surface of said semiconductor chip is bonded to the side of said first surface of said chip mounting portion by an adhesive layer, and such that a part of each of said suspension leads, which is located under said semiconductor chip, is spaced from said rear surface of said semiconductor chip.

45. (Unamended) A semiconductor device according to Claim 44, wherein said adhesive layer is provided on said first surface of said chip mounting portion and is not provided on said part of each of said suspension leads which is located under said semiconductor chip.

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 14

46. (Unamended) A semiconductor device according to Claim 45, wherein a part of said rear surface of said semiconductor chip, which is located outside said chip mounting portion, is adhered to a part of said resin member.

47. (Unamended) A semiconductor device according to Claim 46, wherein said resin member includes a thermosetting resin.

48. (Unamended) A semiconductor device according to Claim 44, wherein said adhesive layer includes an epoxy resin.

49. (Unamended) A semiconductor device comprising:

(a) a semiconductor chip having a plurality of semiconductor elements and bonding pads formed on a main surface thereof and a rear surface opposite to said main surface;

(b) a lead frame having a first surface and a second surface opposite to said first surface, said lead frame having:

a chip mounting portion for mounting said semiconductor chip;

suspension leads continuously formed with said chip mounting portion;

and

a plurality of leads;

(c) a plurality of bonding wires electrically connected to said plurality of leads with said bonding pads of said semiconductor chip respectively; and

(d) a resin member sealing at least said semiconductor chip, said bonding wires, said chip mounting portion and at least portions of said plurality of leads.

KAJIHARA et al., SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 15

wherein a size of said chip mounting portion is smaller than that of said semiconductor chip,

wherein said semiconductor chip is bonded to said chip mounting portion by an adhesive layer between said rear surface of said semiconductor chip and said first surface of said chip mounting portion,

wherein each of said suspension leads has a part which is located under said semiconductor chip, and

wherein a part of said resin member is formed between said part of each of said suspension leads and said rear surface of said semiconductor chip.

50. (Unamended) A semiconductor device comprising:

(1) a semiconductor chip having a main surface and a rear surface opposite to said main surface, said semiconductor chip having a plurality of semiconductor elements and bonding pads formed on said main surface;

(2) a lead frame including:

a first suspension lead for supporting said semiconductor chip, extending in a first direction;

a second suspension lead for supporting said semiconductor chip, extending in a second direction which is different from said first direction, said second suspension lead intersecting said first suspension lead; and

a plurality of leads, said plurality of leads being arranged to surround an intersecting portion of said first and second suspension leads;

(3) a plurality of bonding wires electrically connecting at said plurality of leads with said plurality of bonding pads, respectively; and

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amtd.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 16

(4) a resin body sealing said semiconductor chip, at least a portion of said plurality of leads, said first and second suspension leads and said plurality of bonding wires,

wherein said semiconductor chip is disposed on said intersecting portion of said first and second suspension leads,

wherein a width of each of said first and second suspension leads at the vicinity of said intersecting portion is wider than that of each said first and second suspension leads at vicinities beyond said semiconductor chip, and

wherein said rear surface of said semiconductor chip is fixed to said first and second suspension leads at the vicinity of said intersecting point by an adhesive.

51. (Unamended) A semiconductor device according to Claim 50, wherein said first and second suspension leads intersect each other at a substantially right angle.

52. (Unamended) A semiconductor device according to Claim 51, wherein said resin body has a tetragonal shape, wherein said plurality of leads extends toward four sides of said resin body, and wherein said first and second suspension leads extend from said intersecting portion toward four corners of said resin body.

53. (Unamended) A semiconductor device according to Claim 50, wherein a portion of said rear surface of said semiconductor chip is adhered to said intersecting portion of said first and second suspension leads, and wherein another portion of said rear surface of said semiconductor chip is contacted with said resin body.

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 17

54. (Unamended) A semiconductor device according to Claim 51, wherein said semiconductor chip has a tetragonal shape, and wherein said wider portion at the vicinity of said intersecting portion of said first and second suspension leads extends from a central portion of said rear surface of said semiconductor chip toward four corners of said semiconductor chip.

55. (Unamended) A semiconductor device comprising:

(1) a semiconductor chip having a main surface and a rear surface opposite to said main surface, said semiconductor chip having a plurality of semiconductor elements and bonding pads formed on said main surface;

(2) a lead frame including:

a chip mounting portion for mounting said semiconductor chip;

a plurality of suspension leads which are continuously formed with said chip mounting portion; and

a plurality of leads, said plurality of leads being arranged to surround said chip mounting portion;

(3) a plurality of bonding wires electrically connecting said plurality of leads with said plurality of bonding pads, respectively; and

(4) a resin body sealing said semiconductor chip, at least a portion of said plurality of leads, said chip mounting portion, said plurality of suspension leads and said plurality of bonding wires,

wherein said chip mounting portion has a first portion extending in a first direction and a second portion extending in a second direction which is a different



KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 18

direction from said first direction, said second portion intersecting said first portion,

wherein a width of each of said first and second portions of said chip  
mounting portion is wider than that of each of said plurality of suspension leads,

wherein both ends of each of said first and second portions of said chip  
mounting portion are coupled with said plurality of suspension leads respectively,

wherein an intersecting portion of said first and second portions of said chip  
mounting portion is located at a substantially central portion of said rear surface of  
said semiconductor chip,

wherein said both ends of each of said first and second portions of said chip  
mounting portion are located at the peripheral portions of said rear surface of said  
semiconductor chip, and

wherein said rear surface of said semiconductor chip is fixed to said chip  
mounting portion at both of said central and peripheral portions of said rear surface  
of said semiconductor chip by an adhesive,

56. (Unamended) A semiconductor device according to Claim 55, wherein  
said first and second directions intersect each other at a substantially right angle.

57. (Unamended) A semiconductor device according to Claim 56, wherein  
said resin body has a tetragonal shape, wherein said plurality of leads extends  
toward four sides of said resin body, and wherein said plurality of suspension leads  
extend from said both ends of said first and second portions of said chip mounting  
portion toward four corners of said resin body,

KAJIHARA *et al.*, SN 09/989,242  
20 November 2006 Amdt.  
Reply to 20 March 2006 Office Action

501.32049RV2/329201392US5  
Page 19

58. (Unamended) A semiconductor device according to Claim 55, wherein a portion of said rear surface of said semiconductor chip is adhered to said first and second portions of said chip mounting portion, and wherein another portion of said rear surface of said semiconductor chip is contacted with said resin body.

59. (Unamended) A semiconductor device according to Claim 58, wherein said semiconductor chip has a tetragonal shape, and wherein said both ends of each of said first and second portions are located at the vicinity of four corners of said semiconductor chip.

60. (Unamended) A semiconductor device according to Claim 37, wherein said insulating tape has a closed frame shape.

61. (Unamended) A semiconductor device according to Claim 40, wherein said insulating tape has a closed frame shape.

62. (Unamended) A semiconductor device according to Claim 42, wherein said insulating tape has a closed frame shape.